

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

POC0335 – ORGANIC CHEMISTRY
(Foundation in Life Sciences students only)

13 March 2020
3.00 p.m – 5.00 p.m

(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 5 pages with 5 questions only.
2. Answer ALL questions.
3. Please write all your answers in the answer booklet provided.
4. Distribution of marks for each question is given.

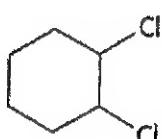
Instructions: Answer ALL questions.

Question 1 [10 marks]

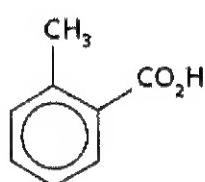
a. Draw an expanded structural formula for the following saturated hydrocarbon: [1 mark]
$$(CH_3)_2CH(CH_2)_3CH(CH_3)CH_2C(CH_3)_3$$

b. What are the molecular formulae of the following compounds? [2 × ½ mark]

(i)

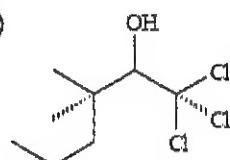


(ii)

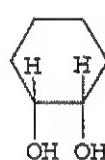


c. Give the IUPAC names for the following compounds: [4 × 1 mark]

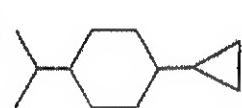
(i)



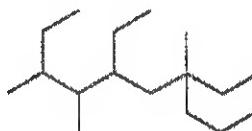
(ii)



(iii)



(iv)



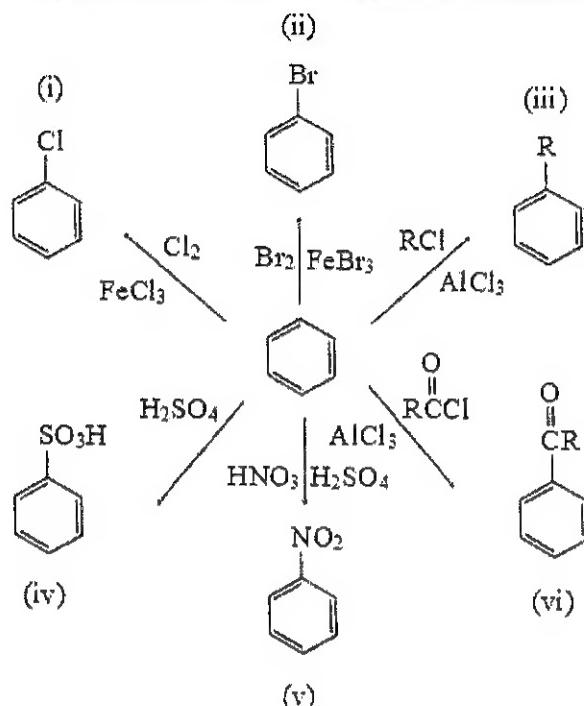
d. Draw the geometric isomers of 1,2- and 1,3-dimethylcyclobutane. [2 marks]

e. There are four structural isomers of C_4H_9OH . Draw them and specify which one of them can exist as a pair of optical isomers (that is, which one is chiral). [2 marks]

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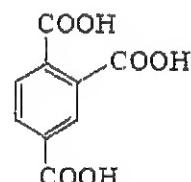
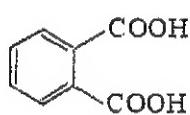
Question 2 [10 marks]

a. Name the following electrophilic aromatic substitution reactions. [6 × ½ mark]



b. Three hydrocarbons **A**, **B** and **C** with the formula C_9H_{12} were oxidised by hot potassium manganate(VII).

- Hydrocarbon **A** gave benzoic acid, $\text{C}_6\text{H}_5\text{COOH}$
- Hydrocarbon **B** gave benzene-1,2-dioic acid.
- Hydrocarbon **C** gave benzene-1,2,4-trioic acid:



Suggest the structures of **A**, **B** and **C**.

[3 × 1 mark]

c. Write equations illustrating the following reactions:

- (i) benzene and 2-chloropropane with aluminum trichloride catalyst. [1 mark]
(ii) *p*-dibromobenzene with concentrated nitric and sulfuric acids. [1 mark]

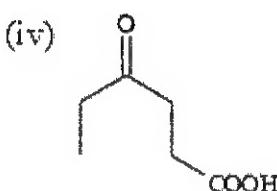
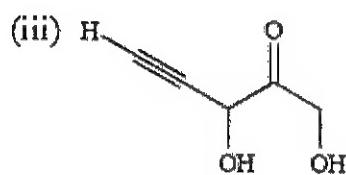
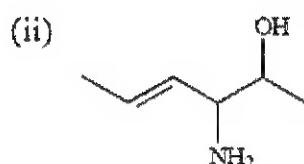
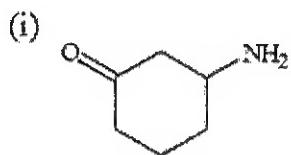
d. Devise a synthesis for *p*-ethylbenzenesulfonic acid from benzene (via 2 steps).

[2 marks]

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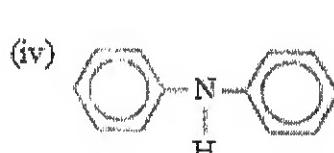
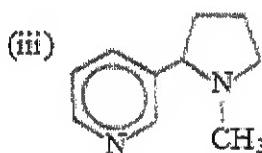
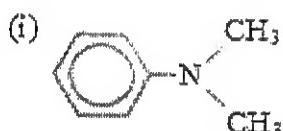
Question 3 [10 marks]

a. Give the IUPAC names for the following compounds: [4 × 1 mark]

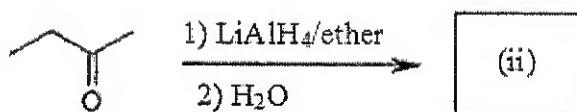
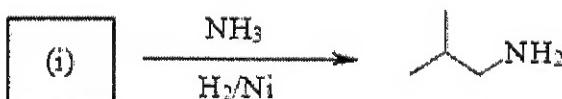


b. Compound A has the molecular formula C₄H₈O (an aldehyde). It reacts with Fehling's solution. On treatment with sodium tetrahydridoborate(III), it gives B (a primary alcohol), which on warming with concentrated sulfuric acid gives 2-methylpropene. Identify A and B (draw and name the structures). [2 × 1 mark]

c. Classify the following amine compounds as primary, secondary or tertiary. [4 × ½ mark]



d. Complete the following reactions: [2 × 1 mark]



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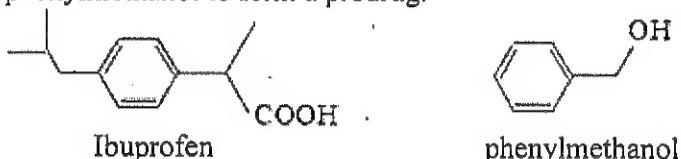
Question 4 [10 marks]

a. Draw the general formula for FOUR carboxylic acid derivatives as below:

[$4 \times \frac{1}{2}$ mark]

- (i) Acid halide (ii) Acid anhydride (iii) Amide (iv) Ester

b. An unwelcome side effect of the non-steroidal anti-inflammatory drug (NSAID) ibuprofen is irritation of the gastro-intestinal tract. This can be reduced by reacting it with phenylmethanol to form a prodrug.



The resulting compound has the added advantage of being more easily transported through the intestinal cell walls into the bloodstream.

- (i) What type of compound will the prodrug be?

[$\frac{1}{2}$ mark]

- (ii) Suggest reagents and conditions for making the prodrug.

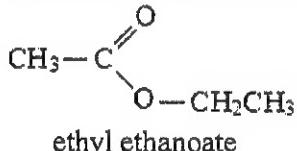
[$\frac{1}{2}$ mark]

- (iii) Draw the structure of the resulting compound.

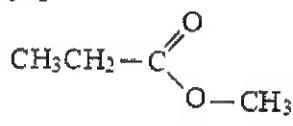
[1 mark]

c. Two isomers of $C_4H_8O_2$ are shown below. Draw the structures of the other two isomeric esters with the formula $C_4H_8O_2$.

[2×1 mark]



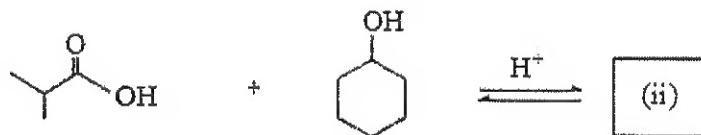
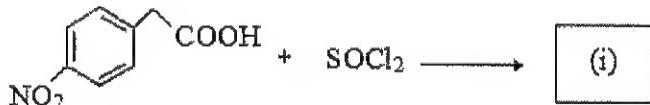
ethyl ethanoate



methyl propanoate

d. Complete these reactions:

[2×1 mark]



e. Draw the structures for the following compounds.

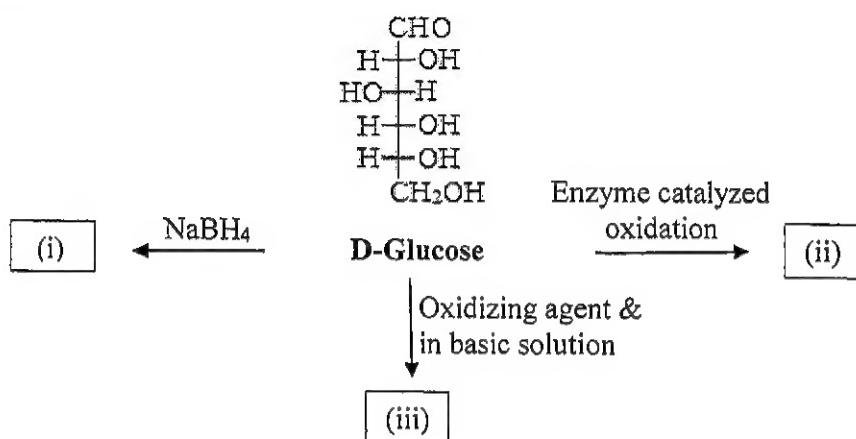
[2×1 mark]

- (i) 2-Chloro-3-phenylbutanoic acid
(ii) 2-Oxocyclopentanecarboxylic acid

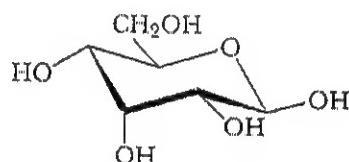
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Question 5 [10 marks]

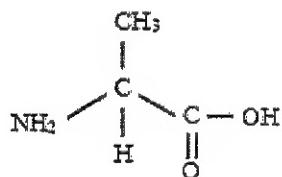
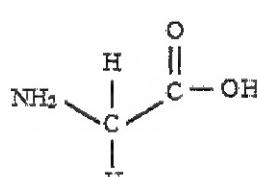
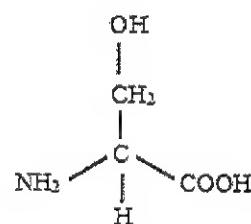
- a. Complete the following reactions by drawing the structures and name the compounds formed. [3 × 1 mark]



- b. Below is the chair conformation of D-Allose. Convert it to an open-chain form and then to a Fischer projection. [2 × 1 mark]



- c. Amino acids are the building blocks of naturally-occurring polymers called proteins. Consider the three amino acids below,

Alanine ($\text{pI} = 6.11$)Glycine ($\text{pI} = 6.06$)Serine ($\text{pI} = 5.68$)

- (i) State the abbreviation for alanine and glycine. [2 × $\frac{1}{2}$ mark]
 (ii) Draw the zwitterion structure for serine. [1 mark]
 (iii) Deduce the structure of the tripeptide formed and indicate the peptide bond in the structure. [2 marks]
 (vi) Describe the behavior of glycine during paper electrophoresis at pH 6.06. [1 mark]

End of Paper